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ALEXANDRIA FIELD OFFICE

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EVALUATION OF LOBLOLLY SEEDLING MORTALITY ON TWO REGENERATION SITES ON THE TALLADEGA NATIONAL FOREST

by

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ABSTRACT

Two regeneration sites were visited on the Talladega National Forest in Alabama. The sites were located on the Shoal Creek Ranger District and had been attacked by pales weevil, Hylobius pales (Herbst.) and Nantucket pine tip moth, Rhyacionia frustrana (Comst.). Both sites suffered 66% seedling mortality during the first growing season. Pales weevil was responsible for the death of at least 33% of the seedlings on each site. The strategy used for planting the sites was valid, but the timetable was not acceptable.

INTRODUCTION

On August 18, 1982, a survey for loblolly pine seedling mortality was made at two sites on the Shoal Creek Ranger District of the Talladega National Forest in Alabama. The regeneration sites visited were 44 and 46 acres in size, respectively. Each of the sites sampled had been planted in February 1980 with loblolly pine seedlings obtained from W. W. Ashe Nursery. The sites had suffered high seedling mortality. The purpose of the evaluation was to determine the cause and a possible remedy for the mortality.

The original plan proposed by the Forest was to harvest the stands during the winter of 1980-1981 and site prepare by March or April 1981. The site preparation treatment included chainsawing all standing trees after logging. Then the sites were to have a hot burn in August to remove the slash and reduce the undergrowth. The sites would then be planted in December 1981 through February 1982.

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However, the original plan of site preparation by April was not adhered to and unacceptable seedling mortality was caused by pales weevil, Hylobius pales (Herbst.) in combination with Nantucket pine tip moth, Rhyacionia frustrana (Comst.).

Biology

The pales weevil spends the winter as an adult in the soil. Overwintering adults emerge from April to June, depending on location, and feed on the tender bark of sapling twigs and at the base of seedlings. This feeding occurs at night and may be extensive enough to girdle the seedling or the seedlings may be totally stripped of stem bark and needles. After a few days of feeding, they fly to recently cut-over or damaged pine lands. Here they feed on the inner bark of freshly cut slash and stumps, mate, and lay eggs in the roots of pine stumps and weakened trees. The larvae feed beneath the bark until early fall. Then they form cells in the sapwood where they pupate. This cell, called the "chip cocoon", is sealed with excelsior-like chips of wood. In the South, adult pales weevils are found all year round, usually well within flying distance of any potential pine cutting area, and they are active nearly all year.

The development of pales weevil larvae is probably temperature dependent, with new adult emergence from pine residue in areas cut before June occurring in the summer and fall of the same year. From pine areas harvested in June, part of the population emerges in the fall and part the following May and June. Emergence from trees cut in July and after occurs from late spring through late summer of the following year. Serious seedling damage is caused by overwintering adults and some emerging brood adults the following year. During warm periods, even in mid-winter, overwintering adults feed on pine seedlings and small pine twigs.

The Nantucket pine tip moth prefers loblolly and shortleaf pines in the South and Southeast. Winter is spent as a pupa within the injured tips of the host. Adults begin to appear on warm, sunny days in early spring. Eggs are deposited on new or old growth needles, in the axils of needles and stems, on developing tips, or on buds. Newly hatched larvae construct delicate webs in axils formed by developing needles and stems. Their feeding severes the needle. Second instar larvae feed in the buds, the connective tissue is severed and the damaged portion turns brown. After 2 to 4 weeks, the larvae bore down the stem and pupate in webbed cells within the shoot. In the South, there are 4 to 5 generations per year.

METHODS

The samples were taken along 1-year seedling survival check stake lines that the Forest had previously installed. The stake lines were installed in such a manner as to represent the different topography in the regeneration site. Fifty stakes were installed at each site, in rows of 10 to 15 stakes, each 1.5 chains apart.

The data for this report were collected from the seedlings by the first 30 stakes located. Dead seedlings were removed from the ground and observed for damage and probable cause of death. Live seedlings were observed for weevil feeding and pine tip moth damage.

OBSERVATIONS AND RESULTS

After the harvest was finished approximately 65 stems per acre of less than 5" DBH remained standing on each site. About 1.5 cunits (approx. 2.25 cords) of merchantable pine timber per acre were left standing by the contractor. All of the standing trees were chainsawed and the sites burned in September 1981, as final preparation for planting during the winter 1981-82. Since the remaining trees after harvest were not cut until September, the fresh slash and stumps became attractive feeding and reproductive sites for the pales weevil. Although the hot fall burn thoroughly charred or burned the slash and chainsawed trees, the stumps from the root collar down were still available as host sites for the weevils.

The increased weevil population combined with other seedling mortality factors caused unacceptable seedling losses. Both sites had 66% seedling mortality during the first growing season (table 1).

Pales weevil feeding was responsible for the death of at least 33% of the seedlings on each site. Another 33% of the seedlings on site 16 and 27% on site 18 had died from unknown causes.

None of the seedlings appeared to have died because of tip moth feeding. However, 23% of the live seedlings did have tip moth damage in the buds. The tip moth damage was not severe, but the additional stress placed on the trees caused their vigor to be reduced.

DISCUSSION

The strategy used for planting sites 16 and 18 was valid. However, the delayed site preparation voided the original planting timetable. The original proposed timetable would have allowed enough time for the weevils to have developed in the fresh stumps and dispersed before the sites were planted. Instead the overwintering and brood weevils, that emerged from the chainsawed stumps, caused serious mortality in the newly planted seedlings.

When site preparation is done before June, burning before planting does not affect pales or tip moth populations. However, when site preparation is late a hot burn will reduce the attractiveness and number of feeding and reproduction sites available to the weevil, but this will not reduce the pales weevil hazard to a safe level. If the site were to be planted that same year, insecticide treatment would be necessary. When accurately

Table 1. Survey of pales weevil and pine tip moth damage on two regeneration sites on the Shoal Creek Ranger District of the Talladega National Forest.

Site Number	Acres	Number Seedlings Checked	Number Live Seedlings		Number Dead Seedlings		Percent Dead Seedlings
			Tip Moth Damage	No Damage	Pales Weevil Damage	No Pales Damage	
16	44	30	7	3	10	10	66
18	46	30	7	3	12	8	66

implemented and timed, the plan developed for regeneration of sites 16 and 18 would not cause any increase of the pales weevil population.

As a general rule, the management guidelines for pales weevil that have been developed for the South are:

> Pine lands cut and site prepared prior to June are safe to plant pines the following November to March without weevil damage. However, on pine lands harvested, residual cut, or site preparation after June then the planting of pine seedlings should be delayed one year (Appendix 1 for additional information). If planting is not delayed, then insecticide treatment should be used to prevent weevil caused mortality.

If planting on recently cut pine lands is delayed one year, the weevils will not be in the area where seedlings are planted. Although this solves the weevil problem easily it is rather expensive to allow the land to lay idle that could otherwise be replanted during the first available planting season. Intensively managed sawtimber stands with a high site index will provide greater economic gain than pulpwood stands, therefore, it is more profitable to invest in control (Appendix II for chemical control alternatives). A more detailed discussion of the economic analysis of damage can be found in Forest Pest Management Report No. 83-1-10, "Evaluation of Pales Weevil Damage and Recommendations for Future Management on the Chattahooche NF" by Ghent and Redmond.

If any further questions arise, please contact the Forest Pest Management Office in Pineville, LA (Telephone: 318/473-7280 Commercial or 497-7280 FTS).

APPENDIX I

Pales weevil hazard rating for pine lands with cultural recommendations and chemical treatments.

Harvest Date	Site Prep Date Cords Left Standing	Site/Hazard	Cultural Recommen.	Chemical Treatment Planting Date	Chemical Treatment
Dec. - May	Dec. - May	None	Plant pines Nov. - Mar.	Nov. - Mar.	None
	June - September				
	(Less than 5 cords/acre)	None	Plant pines Nov. - Mar.	Nov. - Mar.	None
	(More than 5 cords/acre)	Low-Moderate	Plant pines following year or contact insect specialist	Nov. - Mar.	Furadan 10G Imidan 50W + extender Dursban M
June - August	June - September	Moderate	Plant pines following year or contact insect specialist	Nov. - Mar.	Furadan 10G Imidan 50W + extender Dursban M
				March	Furadan 4F
Sept. - Nov.	Oct. - Nov.	High	Plant pines following year or contact insect specialist	Mid Feb. - Mar.	Furadan 10G Imidan 50 + extender Dursban M

APPENDIX II

Chemical Control Alternatives

Imidan Top Dip (Imidan 50W®)

Treatment.--The tops of seedlings are dipped down to and including the root collar in an aqueous suspension of 4 percent active ingredient Imidan (Nord et al., 1978). An adjuvant, either Plantgard® or Nu-Film 17® mixed at 2.7 percent (14 oz./4 gal.) by volume, is optional, but recommended in high hazard areas or if high rainfall is expected. (Imidan can also be used as a post-planting spray. See information under Dursban Spray.)

Operational procedures.--Seedlings in loose bunches are dipped in the suspension for 10 to 15 seconds, insuring good coverage of the lower stem. Dipping can be done at the nursery prior to bundling or bagging seedlings or at the planting site prior to planting.

Precautions.--Dip should be mixed fresh daily. Do not let stand over-night. Agitate frequently to keep the wettable powder in suspension.

Seedlings should be dipped in loose bundles. Dipping of whole, tightly packed, open-ended bundles of 500 to 1,000 seedlings should not be done unless the insecticide will penetrate and coat the entire lower stem of all seedlings. It has been determined that this rate of Imidan will not harm roots of pine seedlings (C. Doggett and J. Deines, personal communication).

When dipping seedlings in the field, rapid drying of roots will be a problem. Therefore, dip in the early morning before wind and temperature increase. Treated seedlings should be heeled-in or returned to a moist atmosphere in polybags or bundles as soon as possible.

Hand planters can use either planting bags or planting buckets. Water in planting buckets should not go above the root collar. Disposable, polyethylene bag inner liners could be used in buckets and bags to prevent a buildup of insecticide in them.

Safety.--During the mixing of Imidan 50W, a respirator, goggles, liquid-proof coveralls or apron, rubber boots, and rubber gloves should be worn. Imidan 50W is a wettable powder which should be wetted thoroughly with a small amount of water to make a slurry before adding the total amount of water. The powder will puff up out of the container and be carried by the slightest breeze during this operation, so it is imperative that a respirator and goggles be worn during mixing, and other workers should stand upwind of the mixing site. During the dipping operation, a face shield should be worn to protect the eyes and face from splashing.

Immediately after dipping the seedlings, whether in the nursery or in the field, they should be placed on a tray or shallow container to catch the excess insecticide. The excess dip can be used over, and this will prevent a buildup of toxic waste in the area. Catch additional drippings with an absorbent which can be disposed of. When Imidan dip is spilled on nursery work tables and floors and it is allowed to dry, a dusty, toxic residue will result. This residue might then be inhaled, so this should be prevented.

Furadan Granules (Furadan 10G)

Treatment.--Ten percent Furadan granules (10 grams or 1 tsp.) are broadcast in a 6-inch diameter circle around the base of the seedling at planting time and covered with a light layer of soil or incorporated into the soil. Granules can also be applied in the planting hole at a reduced rate.

Operational procedure.--Operationally, the granules can be applied by the planter immediately after planting or by another worker following behind him. They have also been applied in the planting hole at reduced rates (2-3 grams). In this case, the granules are metered out by an applicator attached to the planting dibble. A granular applicator on a planting machine could be devised.

Precautions.--Furadan 10G, at rates higher than recommended, is phytotoxic and may cause totally brown foliage and even cessation of growth. Therefore, care must be taken to apply the correct amount. Do not exceed 10 grams when broadcasting Furadan 10G or 3 grams in the planting hole. Brown tips on first flush foliage will probably occur with the above rates of Furadan. This is normal, and it will not affect growth rate or survival. When using the granule applicator, test it as if it were a precision tool to prevent breakage and loss of time for repairs.

Safety.--Bags should be opened and granule reservoirs loaded in an open, well-ventilated place. Persons handling and applying the granules should wear rubber gloves.

Furadan Root Dip (Furadan 4 Flowable)

Treatment.--Seedling roots are dipped or spray coated with a kaolin clay-water slurry containing 1 percent (w/w) active ingredient Furadan flowable formulation.

Operational procedure.--The roots of the seedlings can be dipped or sprayed prior to bundling or bagging at the nursery. They can be sprayed in the polybags. Dipping can be done in the field prior to planting.

Precautions.--Agitate frequently to keep Furadan and clay in suspension.

When seedlings are dipped in the field, it is important to prevent drying out of the roots. (See Precautions under Imidan Top Dip above.) In hand planting operations, planters should use planting bags instead of buckets so insecticide is not washed off roots. Polyethylene bags can be used as disposable inner liners for planting bags to prevent contamination of the bag.

Safety.--When treating seedlings at the nursery, care should be taken to contain the slurry and prevent spills. This can be done by spray coating the roots inside the polybags. If roots are dipped, provision should be made for the excess slurry to drain back into the dipping tank or be absorbed by material in the bundle or polybag or material which can be disposed of periodically without contaminating work tables or the floor. Any spillage on nursery floors or work tables which is allowed to dry will lead to a dusty, toxic residue that might be inhaled at a later time. Workers exposed during the application and handling operation should wear face shields, liquid-proof coveralls, rubber gloves, and rubber boots.

Persons handling treated seedlings during the planting should wear rubber gloves. Care should be taken to disentangle roots before placing in planting bags or bins of planting machines so that spattering of the slurry is prevented. Face shields may be necessary.

Dursban Spray (Dursban M)

Treatment.--Stems of seedlings are sprayed to the point of runoff after planting with a 2 percent ingredient aqueous spray.

Operational procedure.--Seedlings are sprayed with low pressure backpack sprayers.

Safety.--Workers should wear liquid-proof coveralls or apron, rubber boots, goggles, and respirator when mixing spray. They should wear rubber boots and rubber gloves and stand upwind while spraying.

General Safety

The supervisor must tell his employees in detail how to handle insecticides and insecticide-treated seedlings in a sage manner and what to do in case of an accidental contamination of skin and clothing. He has an obligation of not only imparting this information, but seeing to it that the employees work not only imparting this information, but seeing to it that the employees work in a safe manner. Washing hands before eating, handling cigarettes or chewing tobacco, going to the bathroom, and before leaving the job should be stressed. Wash basins, hand washing detergent, water, and towels should be provided at the job site. Torn gloves must be replaced immediately, and workers with blisters and open sores on hands should be given jobs not involving handling insecticides or treated seedlings.

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